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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,421	04/08/2004	Chih-Ho Chiu	250913-1190	7827

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EXAMINER	
JUBA JR, JOHN	
ART UNIT	**PAPER NUMBER**
2872	

DATE MAILED: 09/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/820,421	CHIU ET AL.
	Examiner	Art Unit
	John Juba, Jr.	2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 June 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 6 – 9, 12 – 16, 18, 19, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhaoning Yu, et al (*CLEO '99*). Referring to the discussion of Figure 1, Yu, et al disclose a single embodiment of a wire grid polarizer with double metal layers, comprising:

a transparent substrate (silica);

an array of parallel and elongated dielectric protrusions (of PMMA) on the transparent substrate, wherein the dielectric protrusions have a period (190 nm) and a trench is located between adjacent dielectric layers;

a first metal layer having a first thickness (75 nm combined thickness of metal) in the trench; and

a second metal layer having a second thickness (75 nm combined thickness of metal) and a width (70 nm) on each dielectric protrusion, wherein the first and second metal layers are separated by a vertical distance of 125 nm [200 nm minus the 75 nm thickness of the first metal layer; it is clear from the present

disclosure that the "vertical spacing" is measured between the top of the first metal layer and the bottom of the second metal layer];

wherein the period (190 nm) is in a range of 10 ~ 250 nm;

wherein the first thickness (75 nm) is in the range of 30 – 150 nm and is equal to the second thickness; and wherein the ratio of the width (70 nm) to the period (190 nm) is in the range of 25 ~ 75% (36.8%).

Thus, Yu, et al disclose the invention substantially as claimed. However, Yu, et al disclose a vertical spacing of 125 nm rather than 100 nm, as recited.

Turning to the second to the last paragraph of their disclosure, Yu, et al discuss having performed additional experiments wherein the vertical spacing was varied. Yu, et al teach that the vertical spacing is a variable affecting the polarizing performance of the structure, and demonstrate that variation of the spacing is a matter of routine experimentation.

Barring any *unexpectedly* improved result arising out of the particular selection of a vertical spacing not greater than 100 nm, it appears that one of ordinary skill would have arrived at such a spacing through only routine experimentation and optimization manipulating the resonance between grating layers and concomitant polarization dependence, as suggested by Yu, et al.

With regard to claims 2, 16, 19, and 22, Yu, et al disclose a dielectric layer thickness of 200 nm, and disclose the distance from the bottom of the first metal layer to the bottom of the second metal layer as being 200 nm. Thus, it is clear that the dielectric layer has been patterned (by nanoimprint, beginning with a lithographic step)

all the way down to the substrate, such that the substrate is exposed (to the first metal layer) in the trenches.

Claims 4, 5, 10, 11, and 21, are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu, et al (*CLEO '99*) in view of Garvin, et al (U.S. Patent number 4,289,381). As set forth above for claims 1 and 18, Yu, et al disclose the invention substantially as claimed. However, Yu, et al do not disclose a particular substrate thickness (claims 4 – 5), and do not disclose a protective layer (claims 10-11, and 21).

In the same field of endeavor, Garvin, et al disclose a wire grid polarizer with double metal layers. Garvin, et al teach that the substrate should be chosen so as to be invisible (transparent) to the wavelengths of interest and of a thickness capable of supporting the overlying grid ("on the order of a few mils" for the substrate chosen), and further suggest a protective layer of "substrate material" atop the last metal layer for additional thermal mass and passivation of the upper layer.

With regard to claims 4 and 5, barring any *unexpectedly* improved result, it appears that one of ordinary skill would have arrived at a thickness in the range of 0.5 to 1.5 mm, through only routine experimentation and optimization, since Garvin, et al teach that selection of a substrate thickness is a matter of routine experimentation.

With particular regard to claim 5, Yu, et al disclose a silica wafer as the substrate, but do not disclose the silica as being amorphous (glassine). However, silica glass was well known to be a suitable substrate for optical gratings, and was often selected for its relative abundance and lower cost. Thus, one of ordinary skill would have found it

obvious to substitute silica glass for the silica wafer of Yu, et al, since glass would have been cheaper than a high-purity quartz (silica) wafer.

With regard to claims 10, 11, and 21, it would have been obvious to one of ordinary skill to provide a protective layer of substrate material over the grating of Yu, et al, in the interest of improving the thermal performance of the assembly through increased thermal mass, as fairly suggested by Garvin, et al, and in the interest of passivating the metal layers from oxidation that would degrade the polarizer performance, as fairly suggested by Garvin, et al.

With particular regard to claim 11, the substrate material of Yu, et al is SiO_2 (silica), however, it appears that selection of any of the recited materials would have been an obvious matter of selection a suitable material based upon it thermal characteristics, or transparency, as suggested by Garvin, et al.

Claims 3, 17, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu, et al (*CLEO '99*), in view of J.J. Kuta, et al (*JOSA A*). As set forth above with respect to claims 1, 15, and 18, Yu, et al disclose the invention substantially as claimed. However, Yu, et al do not disclose a remaining dielectric layer formed on the bottom of the trench.

In the same field of endeavor, Kuta, et al discuss polarizing response metal grating lines disposed in a vacuum (self-supporting) as contrasted with metal grating lines disposed on various substrate materials. Kuta, et al teach that the choice of material immediately adjacent the metal features changes the Rayleigh resonances and

thus changes the polarizing response of the grating (see for example, section 4). Thus, Kuta, et al fairly identify the material immediately adjacent the grating lines as a result-effective variable.

Barring any *unexpectedly* improved result, It would have been obvious to one of ordinary skill to provide a thickness of the dielectric layer (PMMA) remaining in the bottom of the trenches of Yu, et al, in the interest of providing a material of different refractive index immediately adjacent the metal grating layer, since Kuta, et al fairly suggest that selection of the adjacent material is a matter of routine experimentation in optimizing the polarizing performance of the grating.

Response to Amendment

Applicants' submission of a new declaration is noted with appreciation as overcoming the previous objection to non-initialed alterations in the original declaration.

Applicants' amendment of claims 1, 15, and 18 is overcomes the previously noted informality and is sufficient in overcoming the previous objection to claims 1 – 22.

The previous rejection of claim 4 under 35 U.S.C. §112, second paragraph has been overcome by Applicants' amendment thereof.

For the reasons set forth below, the previous rejection of claims 1 – 3, 6 – 9, 12 – 18, 20, and 22 under 35 U.S.C. §103(a) as being unpatentable over Zhaoning Yu, et al (*Appl. Phys. Lett., 77(7)*), in view of Perkins, et al (U.S. Patent number 6,122,103), is *withdrawn*.

Although Perkins, et al disclose metal layer thickness as a result-effective variable, the structure of Perkins, et al does not rely upon a resonance between grating layers. Since Perkins, et al do not account for such a resonance, one of ordinary skill would not have had a reasonable expectation of success in merely varying the metal layer thicknesses to achieve the objectives or improve the results of Yu, et al.

The previous rejection of claims 4, 5, 10, 11, and 21 §103(a) as being unpatentable over Yu, et al (*Appl. Phys. Lett., 77(7)*) and Perkins, et al, and further in view of Garvin, et al (U.S. Patent number 4,289,381) is also *withdrawn*, since Garvin, et al fail to cure the aforementioned deficiency in the teachings of Perkins, et al.

Applicants' conclusion that the substrate of Yu, et al "cannot be transparent" is wholly unpersuasive and believed to be erroneous. It does not matter that the aggregate structure of Yu, et al is reflective. The claim recites the transparency of the substrate alone, and does so without even specifying an operative wavelength region. Transparency of the substrate is an inherent optical characteristic. In this case, silica is known to be transparent over the visible range of wavelengths, and notably, is transparent over the range of wavelengths used by Yu, et al.

The examiner agrees with Applicants' remark that the Perkins, et al teaching respecting metal layer thickness, as applied to the structure of Yu, et al (either disclosure) fails to provide the reasonable expectation of success. The examiner does not agree, however, that the polarization *mechanisms* for the transmissive polarizer and the reflective polarizer are distinct. Rather, it is believed that both structures rely upon anomalous diffraction to impart the preferential reflection of light having one polarization

state. The fundamental mechanism is believed to be the same, notwithstanding the spectral contribution of resonance between grating layers observed by Yu, et al.

The examiner believes that the behavior of the Yu, et al (either disclosure) grating is readily predicted using a rigid coupled wave analysis or Maxwell's equations (rather than scalar diffraction), and as such is quite predictable. The fact that Yu, et al use their grating in reflection such that one extinction ratio is observed, does not lead the examiner to conclude that the grating behavior in transmission (where Applicants observe a greater extinction ratio) would be at all "unexpected", as urged by Applicants. Moreover, since the construction of the Yu, et al grating so nearly resembles Applicants' construction, the examiner has reasonable belief that, had the grating of Yu, et al been characterized in transmission, it too would have exhibited the high extinction ratios reported by Applicants.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kleemann, et al (U.S. Patent Appl. Pub. no. 2002/0024735 A1) disclose a grating having a metal thickness atop dielectric protrusions and a metal thickness in trenches between the protrusions, and identify the height of the protrusions as a result-effective variable.

Komuro, et al (U.S. Patent number 6,251,297) disclose a stack of polarizing gratings said to rely upon resonant absorption. The metal features are about 30 nm thick and buried in about 1000 nm of glass.

KYOCERA CORP (JP 2003-066229 A) disclose a multi-layer grating polarizer, and teach providing a quarter-wave optical thickness between grating substrates.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (571) 272-2314. The examiner can normally be reached on Mon.-Fri. 9 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Drew Dunn whose number is (571) 272-2312 and who can be reached on Mon.- Thu., 9 – 5.

The **new centralized fax phone number** for the organization where this application or proceeding is assigned is (571) 273-8300 for *all* communications.

JOHN JUBA, JR.
PRIMARY EXAMINER
Art Unit 2872

August 25, 2005